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AGREEMENT

CONCERNING THE ADOPTION OF UNIFORM CONDITIONS OF APPROVAL AND RECIPROCAL RECOGNITION OF APPROVAL FOR MOTOR VEHICLE EQUIPMENT AND PARTS

done at Geneva on 20 March 1958

Addendum 20: Regulation No. 21

*Revision 2**

Incorporating:

01 series of amendments which entered into force on 8 October 1980
Supplement 1 to the 01 series of amendments which entered into force on 26 April 1986
Corrigendum 1 to Revision 1 referred in the depositary notification
C.N.142.1986.TREATIES-27 of 2 September 1986

UNIFORM PROVISIONS CONCERNING THE APPROVAL OF VEHICLES WITH REGARD TO THEIR INTERIOR FITTINGS

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* Incorporating the amended procedure for determining the "H" point and the actual torso angle for seating positions in motor vehicles, referred to in documents TRANS/SC1/WP29/137, paragraphs 93 to 98 and TRANS/SC1/WP29/341, paragraph 77 and Annex 3, as well as general updating of the administrative provisions.

UNITED NATIONS

Regulation No. 21

UNIFORM PROVISIONS CONCERNING THE APPROVAL OF VEHICLES WITH REGARD TO THEIR INTERIOR FITTINGS

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Regulation No. 21

UNIFORM PROVISIONS CONCERNING THE APPROVAL OF VEHICLES WITH REGARD TO THEIR INTERIOR FITTINGS

1. SCOPE

This Regulation applies to the interior fittings of passenger cars with regard to:

1.1. the interior parts of the passenger compartment other than the rear-view mirror or mirrors;

1.2. the arrangement of the controls;

1.3. the roof and the sliding roof, and

1.4. the seat-back and the rear parts of seats.

2. DEFINITIONS

For the purposes of this Regulation,

2.1. "approval of a vehicle" means the approval of a vehicle type with regard to its interior fittings;

2.2. "vehicle type" with regard to the interior fittings of the passenger compartment (other than the rear view mirrors; the arrangement of controls, the roof or sliding roof, the back rest and rear part of the seats) means power-driven vehicles which do not differ in such essential respects as:

2.2.1. the lines and constituent materials of the bodywork of the passenger compartment;

2.2.2. the arrangement of the controls;

2.3. "reference zone" means the head-impact zone as defined in annex 1 to this Regulation, except:

2.3.1. the area bounded by the forward horizontal projection of a circle circumscribing the outer limits of the steering control, increased by a peripheral band 127 mm in width; this area is bounded below by the horizontal plane tangential to the lower edge of the steering control when the latter is in the position for driving straight ahead;

2.3.2. the part of the surface of the instrument panel comprised between the edge of the area specified in paragraph 2.3.1. above and the nearest inner side-wall of the vehicle; this part of the surface is bounded below by the horizontal plane tangential to the lower edge of the steering control; and

2.3.3. the windscreen side pillars;

2.4. "level of the instrument panel" means the line defined by the points of contact of vertical tangents to the instrument panel;

2.5. "roof" means the upper part of the vehicle extending from the upper edge of the windscreen to the upper edge of the rear window and bounded at the sides by the upper framework of the side-walls;

2.6. "belt line" means the line constituted by the transparent lower contour of the side windows of the vehicle;

2.7. "convertible car" means a vehicle where, in certain configurations, there is no rigid part of the vehicle body above the belt line with the exception of the front roof supports and/or the roll-over bars and/or the seat belt anchorage points;

2.8. "vehicle with opening roof" means a vehicle of which only the roof or part of it can be folded back or be opened, or may slide, leaving the existing structural elements of the vehicle above the belt line;

2.9. "folding (tip-up) seat" means an auxiliary seat intended for occasional use and which is normally folded out of the way.

3. APPLICATION FOR APPROVAL

3.1. The application for approval of a vehicle type with regard to its interior fittings shall be submitted by the vehicle manufacturer or by his duly accredited representative.

3.2. It shall be accompanied by the undermentioned documents in triplicate and the following particulars:

a detailed description of the vehicle type with regard to the items mentioned in paragraph 2.2. above, accompanied by a photograph or an exploded view of the passenger compartment. The numbers and/or symbols identifying the vehicle type shall be specified.

3.3. The following shall be submitted to the technical service responsible for conducting the approval tests:

3.3.1. at the manufacturer's discretion, either a vehicle representative of the vehicle type to be approved or the part or parts of the vehicle regarded as essential for the checks and tests prescribed by this Regulation;

3.3.2. at the request of the aforesaid technical service, certain components and certain samples of the materials used.

4. APPROVAL

4.1. If the vehicle type submitted for approval pursuant to this Regulation meets the requirements of paragraph 5. below, approval of that vehicle type shall be granted.

4.2. An approval number shall be assigned to each type approved. Its first two digits (at present 01 corresponding to the 01 series of amendments which entered into force on 26 April 1986) shall indicate the series of amendment incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The same Contracting Party may not assign the same number to another vehicle type.

4.3. Notice of approval or of extension or refusal or of withdrawal of approval or production definitely discontinued of a vehicle type pursuant to this Regulation shall be communicated to the Parties to the Agreement which apply this Regulation by means of a form conforming to the model in annex 2 to this Regulation.

4.4. There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle conforming to a vehicle type approved under this Regulation, an international approval mark consisting of:

4.4.1. a circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval; 1/

1/ 1 for Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for the Czech Republic, 9 for Spain, 10 for Yugoslavia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 (vacant), 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal, 22 for the Russian Federation, 23 for Greece, 24, 25 (vacant) and 26 for Slovenia. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify the Agreement concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, or in which they accede to that Agreement, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

4.4.2. the number of this Regulation, followed by the letter "R", a dash and the approval number to the right of the circle prescribed in paragraph 4.4.1. above.

4.5. If the vehicle conforms to a vehicle type approved, under one or more other Regulations annexed to the Agreement, in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.4.1. need not be repeated; in such a case, the regulation and approval numbers and the additional symbols of all the Regulations under which approval has been granted in the country which has granted approval under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.4.1. above.

4.6. The approval mark shall be clearly legible and be indelible.

4.7. The approval mark shall be placed close to or on the vehicle data plate affixed by the manufacturer.

4.8. Annex 3 to this Regulation gives examples of arrangement of the approval marks.

5. REQUIREMENTS

5.1. Forward interior parts of the passenger compartment above the level of the instrument panel in front of the front seat "H" points, excluding the side doors

5.1.1. The reference zone defined in paragraph 2.3. above shall not contain any dangerous roughness or sharp edges likely to increase the risk of serious injury to the occupants. The parts referred to in paragraphs 5.1.2. to 5.1.6. below shall be deemed satisfactory if they comply with the requirements of those paragraphs.

5.1.2. Vehicle parts within the reference zone with the exception of those which are not part of the instrument panel and which are placed at less than 10 cm from glazed surfaces shall be energy-dissipating, as prescribed in annex 4 to this Regulation. Those parts within the reference zone which satisfy both of the following conditions shall also be excluded from consideration if:

5.1.2.1. during a test in accordance with the requirements of annex 4 of this Regulation, the pendulum makes contact with parts outside the reference zone; and

5.1.2.2. parts to be tested are placed less than 10 cm away from the parts contacted outside the reference zone, this distance being measured on the surface of the reference zone;

any metal support fittings shall have no protruding edges.

5.1.3. The lower edge of the instrument panel shall, unless it meets the requirements of paragraph 5.1.2. above, be rounded to a radius of curvature of not less than 19 mm.

5.1.4. Switches, pull-knobs and the like, made of rigid material which, measured in accordance with the method prescribed in annex 6, project from 3.2 mm to 9.5 mm from the panel shall have a cross sectional area of not less than 2 cm^2, measured 2.5 mm from the point projecting furthest and shall have rounded edges with a radius of curvature of not less than 2.5 mm.

5.1.5. If these components project more than 9.5 mm from the surface of the instrument panel, they shall be so designed and constructed as to be able, under the effect of a longitudinal horizontal force of 37.8 daN delivered by a flat-ended ram of not more than 50 mm diameter, either to retract into the surface of the panel until they do not project by more than 9.5 mm or to become detached; in the latter case, no dangerous projections of more than 9.5 mm shall remain; a cross-section of not more than 6.5 mm from the point of maximum projection shall be not less than 6.5 cm^2 in area.

5.1.6. In the case of a projection comprising a component made of non-rigid material of less than 50 shore A hardness mounted on a rigid support, the requirements of paragraphs 5.1.4. and 5.1.5. shall apply only to the rigid support.

5.2. Forward interior parts of the passenger compartment below the level of the instrument panel and in front of the front seat "H" points, excluding the side doors and the pedals

5.2.1. Except for the pedals and their fixtures and those components that cannot be contacted by the device described in annex 7 to this Regulation and used in accordance with the procedure described therein, components covered by paragraph 5.2., such as switches, the ignition key, etc. shall comply with the requirements of paragraphs 5.1.4. to 5.1.6.

5.2.2. The handbrake control, if mounted on or under the instrument panel, shall be so placed that when it is in the position of rest there is no possibility of the occupants of the vehicle striking against it in the event of a frontal impact. If this condition is not met, the surface of the control shall satisfy the requirements of paragraph 5.3.2.3. below.

5.2.3. Shelves and other similar items shall be so designed and constructed that the supports in no case have protruding edges, and they shall meet one or other of the following conditions:

5.2.3.1. The part facing into the vehicle shall present a surface not less than 25 mm high with edges rounded to a radius of curvature of not less than 3.2 mm. This surface shall consist of or be covered with an energy-dissipating material, as defined in annex 4 of this Regulation, and shall be tested in accordance therewith, the impact being applied in a horizontal longitudinal direction.

5.2.3.2. Shelves and other similar items shall, under the effect of a forward-acting horizontal longitudinal force of 37.8 daN exerted by a cylinder of 110 mm diameter with its axis vertical, become detached, break up, be substantially distorted or retract without producing dangerous features on the rim of the shelf. The force must be directed at the strongest part of the shelves or other similar items.

5.2.4. If the items in question contain a part made of material less than 50 shore A hardness when fitted to a rigid support, the above requirements, except for the requirements covered by annex 4 relating to energy-absorption, shall apply only to the rigid support.

5.3. Other interior fittings in the passenger compartment in front of the transverse plane passing through the torso reference line of the manikin placed on the rearmost seats

5.3.1. Scope

The requirements of paragraph 5.3.2. below apply to control handles, levers and knobs and to any other protruding objects not referred to in paragraphs 5.1. and 5.2. above. (See also paragraph 5.3.2.2.)

5.3.2. Requirements

If the items referred to in paragraph 5.3.1. above are so placed that occupants of the vehicle can contact them, they shall meet the requirements of paragraphs 5.3.2.1. to 5.3.4. If they can be contacted by a 165 mm diameter sphere and are above the lowest "H" point (see annex 5 of this Regulation) of the front seats and forward of the transverse plane of the torso reference line of the manikin on the rearmost seat, and outside the zones defined in paragraphs 2.3.1. and 2.3.2., these requirements shall be considered to have been fulfilled if:

5.3.2.1. their surface terminates in rounded edges, the radii of curvature being not less than 3.2 mm;

5.3.2.2. control levers and knobs shall be so designed and constructed that, under the effect of a forward acting longitudinal horizontal force of 37.8 daN either the projection in its most unfavourable position is reduced to not more than 25 mm from the surface of the panel or the said fittings become detached or bent; in the two latter cases no dangerous projections shall remain. Window winders may, however, project 35 mm from the surface of the panel;

5.3.2.3. the handbrake control, when in the released position, and the gear lever, when in any forward gear position, have, except when placed in the zones defined in paragraphs 2.3.1. and 2.3.2. and in the zones below the horizontal plane passing through the "H" point of the front seats, a surface area of not less than 6.5 cm^2 measured at a cross-section normal to the longitudinal horizontal direction up to a distance of 6.5 mm from the part projecting furthest, the radius of curvature being not less than 3.2 mm.

5.3.3 The requirements in paragraph 5.3.2.3. shall not apply to a floor-mounted handbrake control; for such controls, if the height of any part in the released position is above a horizontal plane passing through the lowest "H" point of the front seats (see annex 5 of this Regulation) the control shall have a cross sectional area of at least 6.5 cm^2 measured in a horizontal plane not more than 6.5 mm from the furthest projecting part (measured in the vertical direction). The radius of curvature shall not be less than 3.2 mm.

5.3.4. The other elements of the vehicle's equipment not covered by the above paragraph, such as seat slide rails, devices for regulating the horizontal or vertical part of the seat, devices for rolling up safety belts, etc. are not subject to any regulation if they are situated below a horizontal line passing through the "H" point of each seat even though the occupant is likely to come into contact with such elements.

5.3.4.1. Components mounted on the roof but which are not part of the roof structure, such as grab handles, lights and sun visors, etc. shall have a radius of curvature not less than 3.2 mm and, in addition, the width of the projecting parts shall not be less than the amount of their downward projection; alternatively, these components shall pass the energy-dissipating test in accordance with the requirements of annex 4.

5.3.5. If the parts considered above comprise a component made of material of less than 50 shore A hardness, mounted on a rigid support, the above requirements shall apply only to the rigid support.

5.4. Roof

5.4.1. Scope

5.4.1.1. The requirements of paragraph 5.4.2. below apply to the inner face of the roof.

5.4.1.2. However, they do not apply to such parts of the roof as cannot be touched by a sphere 165 mm in diameter.

5.4.2. Requirements

5.4.2.1. That part of the inner face of the roof which is situated above or forward of the occupants shall exhibit no dangerous roughness at sharp edges, directed rearwards or downwards. The width of the projecting parts shall not be less than the amount of their downward projection and the edges shall have a radius of curvature of not less than 5 mm. In particular, the rigid roof sticks or ribs, with the exception of the header rail of the glazed surfaces and door frames, shall not project downwards more than 19 mm.

5.4.2.2. If the roof sticks or ribs do not meet the requirements of paragraph 5.4.2.1. they shall pass the energy-dissipating test in accordance with the requirement of annex 4 to this Regulation.

5.4.2.3. The metal wires which stretch the lining of the roof and the frames of the sun visors shall have a maximum diameter of 5 mm or be able to absorb the energy, as prescribed in annex 4 to this Regulation. Non-rigid attachment elements of the frames of the sun visors shall meet the requirements of paragraph 5.3.4.1. above.

5.5. Vehicles with an opening roof

5.5.1. Requirements

5.5.1.1. The following requirements and those of paragraph 5.4. above shall apply to vehicles with an opening roof when the roof is in the closed position.

5.5.1.2. In addition, the opening and operating devices shall:

5.5.1.2.1. be so designed and constructed as to exclude accidental or inopportune operation as far as possible;

5.5.1.2.2. their surfaces shall terminate in rounded edges, the radii of curvature being not less than 5 mm;

5.5.1.2.3. be accommodated, when in the position of rest, in areas which cannot be touched by a sphere 165 mm in diameter. If this condition cannot be met, the opening and operating devices shall, in the position of rest, either remain retracted or be so designed and constructed, that, under the effect of a force of 37.8 daN applied in the direction of impact defined in annex 4 to this Regulation as the tangent to the trajectory of the headform, either the projection as described in annex 6 to this Regulation shall be reduced to not more than 25 mm beyond the surface on which the devices are mounted or the devices shall become detached; in the latter case, no dangerous projections shall remain.

5.6. Convertible vehicles

5.6.1. In the case of convertible vehicles, only the underside of the top of the roll-bar and the top of the windscreen frame in all its normal utilization positions shall comply with the requirements of paragraph 5.4. The system of folding rods or links used to support a non-rigid roof shall, where they are situated above and forward of the occupants, exhibit no dangerous roughness or sharp edges, directed rearwards or downwards.

5.7. Rear parts of seats anchored to the vehicle

5.7.1. Requirements

5.7.1.1. The surface of rear parts of seats shall exhibit no dangerous roughness or sharp edges likely to increase the risk or severity of injury to the occupants.

5.7.1.2. Except as provided in paragraphs 5.7.1.2.1., 5.7.1.2.2. and 5.7.1.2.3. below, that part of the back of the front seat which is in the head-impact zone defined in annex 1 of this Regulation shall be energy-dissipating, as prescribed in annex 4 to this Regulation. For determining the head-impact zone the front seats shall, if they are adjustable, be in the rearmost driving position with their backs inclined as near as possible to 25° unless indicated otherwise by the manufacturer.

5.7.1.2.1. In the case of separate front seats, the rear passengers' head-impact zone shall extend for 10 cm on either side of the seat centreline, in the top part of the rear of the seat-back.

5.7.1.2.1.1. In the case of seats fitted with head restraints, each test shall be carried out with the head-restraint in the lowest position and at a point situated on the vertical line passing through the centre of the head-restraint.

5.7.1.2.1.2. In the case of a seat which is designed to be fitted in several types of vehicle, the impact zone shall be determined by the vehicle whose rearmost driving seat position is, of each of the types considered, the least favourable; the resultant impact zone will be deemed adequate for the other types.

5.7.1.2.2. In the case of front bench seats, the impact zone shall extend between the longitudinal vertical planes 10 cm outboard of the centreline of each designated outboard seating position. The centreline of each outboard seating position of a bench seat shall be specified by the manufacturer.

5.7.1.2.3. In the head impact zone outside the limits prescribed in paragraphs 5.7.1.2.1. to 5.7.1.2.2. inclusive, the seat frame structure shall be padded to avoid direct contact of the head with it; and, in these zones, shall have a radius of curvature of at least 5 mm. These parts may alternatively satisfy the energy-dissipation requirements specified in annex 4 to this Regulation.

5.7.2. These requirements shall not apply to the rearmost seats, to seats facing sideways or rearwards, to back-to-back seats or to folding (tip-up) seats. If the impact zones of the seats, head restraints and their supports contain parts covered with material softer than 50 shore A hardness, the above requirements, with the exception of those relating to energy-dissipation described in annex 4 to this Regulation, shall apply only to the rigid parts.

5.7.3. The requirements of paragraph 5.7. shall be considered to be satisfied in the case of head restraints that either are part of a vehicle type approved under Regulation No. 17 (03 series of amendments) or are approved under Regulation No. 25 (02 series of amendments).

5.8. Other not mentioned fittings

5.8.1. The requirements of paragraph 5. shall apply to such fittings not mentioned in previous paragraphs as, according to their location, are capable of being contacted by the occupants in accordance with the various procedures prescribed in paragraphs 5.1. to 5.7. If the contactable members of such fittings are made of material of less than 50 shore A hardness mounted on a rigid support, the requirements shall apply only to the rigid support.

6. MODIFICATIONS AND EXTENSION OF APPROVAL OF THE VEHICLE TYPE

6.1. Every modification of the vehicle type shall be notified to the administrative department which approved the vehicle type. The department may then either:

6.1.1. consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the vehicle still complies with the requirements; or

6.1.2. require a further test report from the technical service responsible for conducting the tests.

6.2. Confirmation or refusal of approval, specifying the alterations, shall be communicated by the procedure specified in paragraph 4.3. above to the Parties to the Agreement which apply this Regulation.

6.3. The competent authority issuing the extension of approval shall assign a series number for such an extension and inform thereof the other Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model in annex 2 to this Regulation.

7. CONFORMITY OF PRODUCTION

7.1. Every vehicle bearing an approval mark as prescribed under this Regulation shall conform to the vehicle type approved.

7.2. In order to verify conformity as prescribed in paragraph 7.1. above, a vehicle bearing the approval mark required by this Regulation shall be taken from the series.

7.3. Production shall be deemed to conform to the requirements of this Regulation if the requirements of paragraph 5. above are met.

8. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

8.1. The approval granted in respect of a vehicle type pursuant to this Regulation may be withdrawn if the requirement laid down in paragraph 7.1. above is not complied with or if the vehicle fails to pass the checks prescribed in paragraph 7. above.

8.2. If a Party to the Agreement which applies this Regulation withdraws an approval it has previously granted, it shall forthwith so notify the other Contracting Parties applying this Regulation, by means of a communication form conforming to the model in annex 2 to this Regulation.

9. PRODUCTION DEFINITELY DISCONTINUED

If the holder of the approval completely ceases to manufacture a type of vehicle under this Regulation, he shall inform thereof the authority which granted the approval. Upon receiving the relevant communication, that authority shall inform the other Parties to the Agreement which apply this Regulation thereof by means of a communication form conforming to the model in annex 2 to this Regulation.

10. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS, AND OF ADMINISTRATIVE DEPARTMENTS

The Parties to the Agreement applying this Regulation shall communicate to the United Nations Secretariat the names and addresses of the technical services responsible for conducting approval tests and of the administrative departments which grant approval and to which forms certifying approval or refusal or withdrawal of approval, issued in other countries, are to be sent.

EXPLANATORY NOTES

Paragraph 2.3.

The reference zone is outlined without rear view mirror. The energy-dissipation test is accomplished without the rear view mirror. The pendulum shall not impact the mirror mounting.

Paragraphs 2.3. and 2.3.1.

The exempted area behind the steering wheel as defined by these paragraphs is also valid for the head impact area of the front passenger(s).

In the case of adjustable steering wheels the zone finally exempted is reduced to the common area of the exempted zones for each of the driving positions which the steering wheel may assume.

In the case where it is possible to choose between various steering wheels the exempted zone is determined by the use of the least favourable steering wheel having the smallest diameter.

Paragraph 2.4.

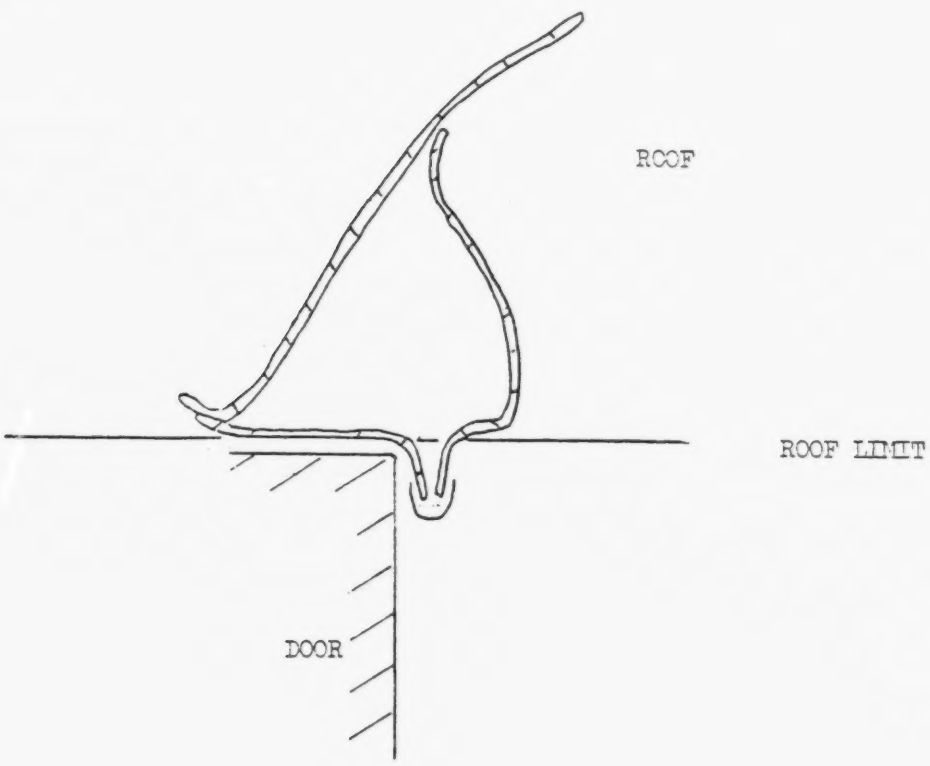
The level of the instrument panel extends over the entire width of the passenger compartment and is defined by the rearmost points of contact of a vertical line with the surface of the instrument panel when the line is moved across the width of the vehicle. Where two or more points of contact occur simultaneously, the lower point of contact shall be used to establish the level of the instrument panel. In the case of consoles, if it is not possible to determine the level of the instrument panel by reference to the points of contact of a vertical line the level of the instrument panel shall be where a horizontal line 25.4 mm above the "H" point of the front seats intersects the console.

Paragraph 2.5.

At the vehicle sides the roof shall commence at the upper edge of the door aperture. In the normal case, the lateral roof limits will be represented by the contours formed by the bottom edge (lateral view) of the remaining body when the door has been opened. In the case of windows, the lateral limitation of the roof will be the continuous transparent line (penetration point of the lateral window panes). At the posts, the lateral roof limitation will pass through the connecting line between the transparent lines. The definition of paragraph 2.5. is also valid for any opening for the roof, in the closed position, of a vehicle as defined in paragraphs 2.7. or 2.8.

For measuring purposes, downward facing flanges shall be ignored. These will be considered as forming part of the vehicle sidewall.

FIGURE



Paragraph 2.7.

A non-removable rear window is understood to be a rigid structural element.

Cars with non-removable rear windows of rigid material are considered to be cars with opening roofs as defined under paragraph 2.8.

Paragraph 5.1.1.

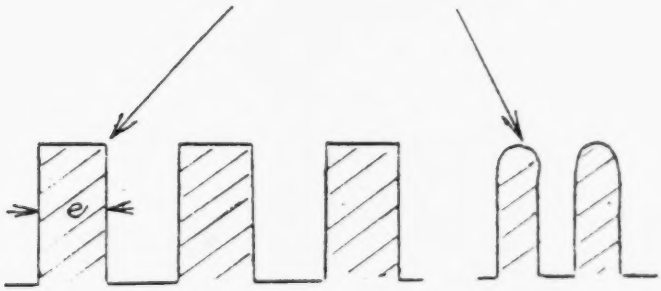
A sharp edge is an edge of a rigid material having a radius of curvature of less than 2.5 mm except in the case of projections of less than 3.2 mm, measured from the panel. In this case, the minimum radius of curvature shall not apply provided the height of the projection is not more than half its width and its edges are blunted.

Grills are considered to comply with the regulations if they meet the minimum requirements of the following table:

mm

gap between elements	flat elements		rounded elements min. radius
	e/min.	min. radius	
0 - 10	1.5	0.25	0.5
10 - 15	2.0	0.33	0.75
15 - 20	3.0	0.50	1.25

MIN. RADIUS



Paragraph 5.1.2.

During the test, it is determined whether parts within the impact zone used for reinforcement may be displaced or protrude so as to increase the hazards to passengers or the severity of injuries.

Paragraph 5.1.3.

These two concepts (level and lower edge of the instrument panel) may be distinct. However, this point is included in paragraph 5.1. (... above the level of the instrument panel ...) and, therefore is applicable only where these two concepts are combined. In the case where the two concepts are not combined, i.e. where the bottom edge of the instrument panel is located below the level of the instrument panel, it will be considered under paragraph 5.3.2.1. by reference to paragraph 5.8.

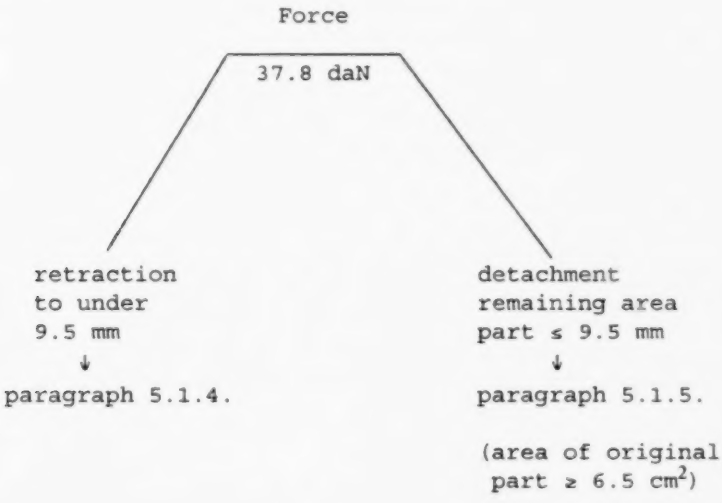
Paragraph 5.1.4.

If a pull handle or knob has a width dimension equal to or more than 50 mm and is located in a zone such that if it were less than 50 mm in width the maximum projection would be determined using the headform measuring apparatus with annex 6, paragraph 2, the maximum projection shall be determined in accordance with annex 6, paragraph 1, i.e. by using a 165 mm diameter sphere and determining the maximum variation in height of the "y" axis.

The cross-sectional area shall be measured in a plane parallel to the surface on which the component is mounted.

Paragraph 5.1.5.

Paragraphs 5.1.4. and 5.1.5. complement each other; the first sentence of paragraph 5.1.5. (i.e. a force of 37.8 daN for retraction or detachment) is applied and then paragraph 5.1.4. in case of retraction up to a protrusion between 3.2 and 9.5 mm or, in the case of detachment, the two last sentences of paragraph 5.1.5. (the cross-section area is measured before the force is applied). However, if, under practical circumstances paragraph 5.1.4. must be applied (retraction to under 9.5 mm and over 3.2 mm) it could be more convenient, at the manufacturer's discretion, to verify the specifications of paragraph 5.1.4. before applying the force of 37.8 daN specified in paragraph 5.1.5.



Paragraph 5.1.6.

Since, in the presence of soft materials, the requirements apply only to the rigid support, the projection is measured for the rigid support only.

The shore hardness measurement is made on samples of the test subject itself. Where, due to the condition of the material, it is impossible to carry out a hardness measurement by the shore A procedure, comparable measurements shall be used for evaluation.

Paragraph 5.2.1.

Foot pedals, their arms and immediate pivotal mechanism, but not the surrounding support metal, shall be excluded from consideration.

The ignition key is deemed to satisfy the requirements of this paragraph if the protruding part of its shank consists of a material of between 60 and 80 shore A hardness and a thickness of at least 5 mm, or is covered with such a material of 2 mm minimum thickness on all surfaces.

Paragraph 5.2.2.

The criterion to determine whether the parking brake control can be contacted is the use of:

the simulated head specified in annex 1, if the control is located above or on the level of the instrument panel (to be tested in accordance with paragraph 5.1. and within the impact zone);

the knee specified in annex 7 if the control element is located below the level of the instrument panel (in this case the control lever is tested in accordance with paragraph 5.3.2.3.).

Paragraph 5.2.3.

The technical specifications listed in paragraph 5.2.3. apply also to shelves and those parts of consoles below the level of the instrument panel located between the front seats, provided that these are located in front of the "H" point. If a cavity is closed it will be treated as a glove compartment and not be subject to these specifications.

Paragraph 5.2.3.1.

The dimensions specified refer to the surface before the addition of material of less than 50 shore A hardness (see para. 5.2.4.).
Energy-dissipating tests shall be conducted in the spirit of annex 4.

Paragraph 5.2.3.2.

If a shelf becomes detached or breaks up, no dangerous features must result; this applies not only to the rim but also to other edges facing into the passenger compartment as a result of the applied force.

The strongest part of the shelf shall be considered to be adjacent to a fixture. Also, "substantially distorted" shall mean that, under the effect of the applied force, the deflection of the shelf, measured from the initial point of contact with the test cylinder, must be a fold or a deformation visible to the naked eye. Elastic deformation shall be admissible.

The length of the test cylinder shall be at least 50 mm.

Paragraph 5.3.

"Other parts" shall include such parts as window catches, seat belt upper anchorages and other parts located in the foot space and at the door side, unless these parts have been treated previously or are exempted in the text.

Paragraph 5.3.2.

The space between the forward bulkhead and the instrument panel which is located higher than the bottom edge of the instrument panel is not subject to the specifications of paragraph 5.3.

Paragraph 5.3.2.1.

The 3.2 mm radius applies to all contactable components covered by paragraph 5.3. when considered in all positions of use.

As exceptions, glove compartments shall be considered only in the closed position; seat belts will normally be considered only in the fastened position, but any part which has a fixed stowage position shall also comply with the 3.2 mm radius requirement in that stowed position.

Paragraph 5.3.2.2.

The reference surface is found by application of the device described in annex 6, paragraph 2, with a force of 2 daN. Where this is not possible, the method described in annex 6, paragraph 1, shall be used with a force of 2 daN.

The evaluation of dangerous projections is subject to the discretion of the authority responsible for the tests.

The force of 37.8 daN is applied even if the original projection is less than 35 or 25 mm, as applicable. The projection is measured under the applied load.

The horizontal, longitudinal force of 37.8 daN is normally applied by means of a flat-ended ram of not more than 50 mm diameter but, where this is not possible, an equivalent method may be used; for instance, by removing obstacles.

Paragraph 5.3.2.3.

The furthest projecting part, in the case of a gear lever, is that part of the grip or knob first contacted by a vertical transverse plane moved in a longitudinal, horizontal direction. If any part of a gear lever or handbrake lies above the "H" point level, that lever will have to be considered as if the whole of it were above the "H" point level.

Paragraph 5.3.4.

Where the horizontal plane(s) passing through the "H" point of the lowest front and rear seats do not coincide, then a vertical plane perpendicular to the vehicle's longitudinal axis shall be determined, passing through the front seat "H" point. The exempted zone will then be considered separately for both the front and rear passenger compartments, relative to their respective "H" point and up to the vertical plane defined above.

Paragraph 5.3.4.1.

Movable sun visors shall be considered in all positions of use. The frames of sun visors shall not be regarded as rigid supports (see para. 5.3.5.).

Paragraph 5.4.

When the roof is tested to measure those protrusions and parts which can be contacted by a ball having a diameter of 165 mm, the roof lining must be removed. When evaluating the specified radii the proportions and properties attributable to the materials of the roof lining shall be taken into consideration. The roof testing area shall extend in front of and above the transverse plane limited by the torso reference line of the manikin placed on the rearmost seat.

Paragraph 5.4.2.1.

(See para. 5.1.1. for definition of "sharp edges").

The downward projection shall be measured normal to the roof in accordance with annex 6, paragraph 1.

The width of the projecting part shall be measured at right angles to the line of the projection. In particular the rigid roof sticks or ribs shall not project away from the inner surface of the roof more than 19 mm.

Paragraph 5.5.

Any roof ribs on opening roofs must meet paragraph 5.4. if they are contactable by a 165 mm diameter sphere;

Paragraphs 5.5.1.2., 5.5.1.2.1., 5.5.1.2.2.

The opening and operating devices when in a position of rest and with the roof closed must meet all of the specified conditions.

Paragraph 5.5.1.2.3.

The force of 37.8 daN is applied even if the original projection is 25 mm or less. The projection is measured under the applied load.

The force of 37.8 daN applied in the direction of impact defined in annex 4 as the tangent to the trajectory of the headform is normally applied by means of a flat-ended ram of not more than 50 mm diameter, but where this is not possible an equivalent method may be used; for instance, by removing obstacles.

The "position of rest" means the position of the operating device when it is in the locked position.

Paragraph 5.6.

The rod system of convertible tops does not represent a roll-over bar.

Paragraph 5.6.1.

The top part of the windscreen frame starts above the transparent contour of the windscreen.

Paragraph 5.7.1.1.

See paragraph 5.1.1. for definition of "sharp edge".

Paragraph 5.7.1.2.

In defining the head impact zone of the back of the front seats any structure necessary to support the seat back shall be considered as a component of this seat back.

Paragraph 5.7.1.2.3.

The padding of the seat frame structure shall also avoid dangerous roughness and sharp edges likely to increase the risk of serious injuries to the occupants.

ANNEX 1

DETERMINATION OF THE HEAD-IMPACT ZONE

Paragraph 2.1.1.2.

The choice between the two procedures for determining height is to be left to the manufacturer.

Paragraph 2.2.

When determining points of contact, the length of the arm of the measuring apparatus is not changed during a particular operation. Each operation starts from the vertical position.

Paragraph 3.

The 25.4 mm dimension means the measurement from a horizontal plane passing through the "H" point to the horizontal tangent to the lower profile of the headform.

ANNEX 4

PROCEDURE FOR TESTING ENERGY-DISSIPATING MATERIALS

Paragraph 1.4.

The breakage of any component during the energy-dissipation test, see Note on paragraph 5.1.2.

ANNEX 5

PROCEDURE FOR DETERMINING THE "H" POINT AND THE ACTUAL TORSO ANGLE FOR SEATING POSITIONS IN MOTOR VEHICLES

Paragraph 4.

For determining the "H" point of any seat, other seats may be removed if necessary.

Annex 1

DETERMINATION OF THE HEAD-IMPACT ZONE

1. The head-impact zone comprises all the non-glazed surfaces of the interior of a vehicle which are capable of entering into static contact with a spherical head 165 mm in diameter that is an integral part of a measuring apparatus whose dimension from the pivotal point of the hip to the top of the head is continuously adjustable between 736 mm and 840 mm.

2. The aforesaid zone shall be determined by the following procedure or its graphic equivalent:

2.1. The pivotal point of the measuring apparatus shall be placed as follows for each seating position for which the manufacturer has made provision:

2.1.1. In the case of sliding seats:

2.1.1.1. at the "H" point (see annex 5), and

2.1.1.2. at a point situated horizontally 127 mm forward of the "H" point and either at a height resulting from the variation in the height of the "H" point caused by a forward shift of 127 mm or of 19 mm.

2.1.2. In the case on non-sliding seats:

2.1.2.1. at the "H" point of the seat considered.

2.2. All points of contact situated forward of the "H" point shall be determined, for each dimension from the pivoted point to the top of the head capable of being measured by the measuring apparatus within the interior dimensions of the vehicle.

2.2.1. In the case where the headform, with the arm set at minimum length, overlaps the front seat, from the rear "H" point, no contact point is established for this particular operation.

2.3. With measuring apparatus vertical, possible points of contact shall be determined by pivoting it forwards and downwards through all arcs of vertical planes as far as 90° on either side of the longitudinal vertical plane of the vehicle which passes through the "H" point.

2.3.1. To determine the points of contact, the length of the arm of the measuring apparatus shall not be changed during any given excursion. Each excursion shall start from a vertical position.

3. A "point of contact" is a point at which the head of the apparatus touches a part of the interior of the vehicle. The maximum downward movement shall be downward movement to a position where the head is tangential to a horizontal plane situated 25.4 mm above the "H" point.

Annex 2

COMMUNICATION

(maximum format: A4 (210 x 297 mm))

Issued by: Name of administration

.....
.....
.....

concerning: 2/ APPROVAL GRANTED
APPROVAL EXTENDED
APPROVAL REFUSED
APPROVAL WITHDRAWN
PRODUCTION DEFINITELY DISCONTINUED

of a vehicle type with regard to its interior fittings
pursuant to Regulation No. 21

Approval No.: ..... Extension No: .....

1. Trade name or mark of the vehicle.....

2. Vehicle type.....

3. Manufacturer's name and address.....

4. If applicable, name and address of manufacturer's representative.....
.....

5. Vehicle submitted for approval on .....

6. Technical service responsible for conducting approval tests .....
.....

7. Date of test report .....

8. Number of test report .....

9. Remarks: Type of vehicle (sedan, station wagon) .....

10. Position of the approval mark .....

11. Approval granted/extended/refused/withdrawn 2/ .....

12. Reason(s) of extension (if applicable) .....

13. Place.....

14. Date.....

15. Signature.....

The list of documents deposited with the Administrative Service which has granted approval is annexed to this communication and may be obtained on request.

1/ Distinguishing number of the country which has granted/extended/refused/withdrawn approval (see approval provisions in the Regulation).

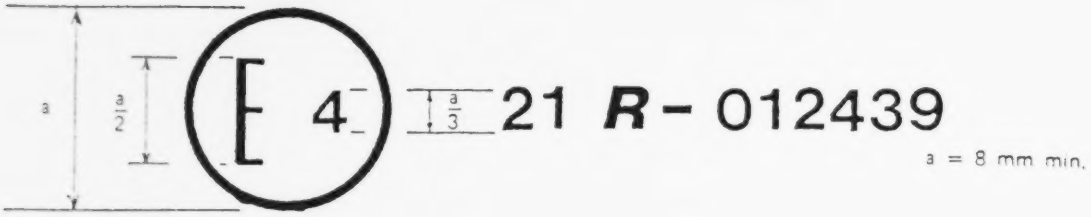
2/ Strike out what does not apply.

Annex 3

ARRANGEMENTS OF THE APPROVAL MARKS

Model A

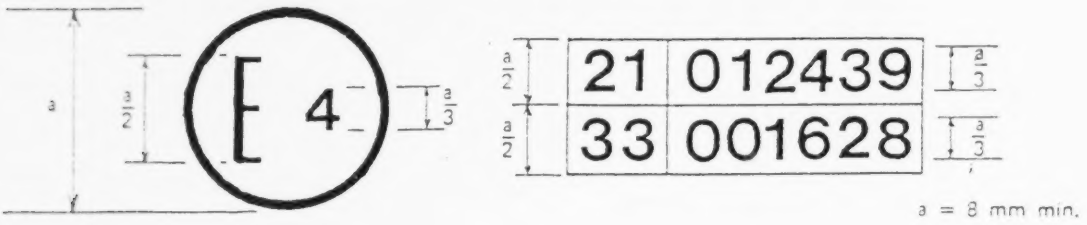
(See paragraph 4.4. of this Regulation)



The above approval mark affixed to a vehicle shows that the vehicle type concerned has, with regard to its interior fittings, been approved in the Netherlands (E 4), under the number 012439. The first two digits of the approval number indicate that the approval was granted in accordance with the requirements of Regulation No. 21 as amended by the 01 series of amendments.

Model B

(See paragraph 4.5. of this Regulation)



The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in the Netherlands (E 4) pursuant to Regulations Nos. 21 and 33. 1/ The first two digits of the approval numbers indicate that, on the date on which these approvals were granted, Regulation No. 21 included the 01 series of amendments and Regulation No. 33 was still in its original form.

1/ The second number is given merely as an example.

Annex 4

PROCEDURE FOR TESTING ENERGY-DISSIPATING MATERIALS

1. Setting up; test apparatus; procedure

1.1. Setting up

1.1.1. The component made of energy-dissipating materials shall be mounted and tested on the structural supporting member on which it is to be installed on the vehicle. The test shall preferably be carried out, where possible, directly on the body. The structural member, or the body, shall be firmly attached to the test bench so that it does not move under impact.

1.1.2. However, at the manufacturer's request, the component may be mounted on a fitting simulating installation on the vehicle, on condition that the assembly comprising the component and the fitting has the same geometrical arrangement as, and a degree of rigidity not lower and an energy-dissipating capacity not higher than those of the real assembly comprising the component and the structural supporting member.

1.2. Test apparatus

1.2.1. This apparatus consists of a pendulum whose pivot is supported by ball-bearings and whose reduced mass 1/ at its centre of percussion is 6.8 kg. The lower extremity of the pendulum consists of a rigid headform 165 mm in diameter whose centre is identical with the centre of percussion of the pendulum.

1.2.2. The headform shall be fitted with two accelerometers and a speed transducer, all capable of measuring values in the direction of impact.

1.3. Recording instruments

The recording instruments used shall be such that measurements can be made with the following degrees of accuracy:

1.3.1. Acceleration:

accuracy = ± 5% of the real value;

frequency response = up to 1,000 Hz;

cross axis sensitivity = ⟩ 5% of the lowest point on the scale.

1.3.2. Speed:

accuracy = ± 2.5% of real value;

sensitivity = 0.5 km/h.

1.3.3. Time recording:

the instrumentation shall enable the action to be recorded throughout its duration and readings to be made to within one thousandth of a second;

the beginning of the impact at the moment of first contact between the headform and the test component shall be noted on the recordings used for analysing the test.

1.4. Test procedure

1.4.1. At every point of impact on the surface to be tested the direction of impact is the tangent to the trajectory of the headform of the measuring apparatus defined in annex 1.

1.4.1.1. For testing the parts, as referred to in paragraphs 5.3.4.1. and 5.4.2.2. of this Regulation, the arm of the measuring apparatus shall be lengthened until contact is made with the part to be considered, up to a limit of 1,000 mm between the pivot point and the top of the head of the apparatus. However, any roof sticks or ribs referred to in paragraph 5.4.2.2. which cannot be contacted shall remain subject to the requirements of paragraph 5.4.2.1. of this Regulation, with the exception of that relating to the height of the projection.

1.4.2. Where the angle between the direction of impact and the perpendicular to the surface at the point of impact is 5° or less, the test shall be carried out in such a way that the tangent to the trajectory of the centre of percussion of the pendulum coincides with the direction of impact. The headform shall strike the test component at a speed of 24.1 km/h; this speed shall be achieved either by the mere energy of propulsion or by using an additional impelling device.

1.4.3. Where the angle between the direction of impact and the perpendicular to the surface at the point of impact is more than 5°, the test may be carried out in such a way that the tangent to the trajectory of the centre of percussion of the pendulum coincides with the perpendicular to the point of impact. The test speed shall then be reduced to the value of the normal component of the speed prescribed in paragraph 1.4.2.

2. Results

2.1. In tests carried out according to the above procedures, the deceleration of the headform shall not exceed 80 g continuously for more than 3 milliseconds. The deceleration rate taken shall be the average of the readings of the two decelerometers.

3. Equivalent procedures

3.1. Equivalent test procedures shall be permitted on condition that the results required in paragraph 2. above can be obtained.

3.2. Responsibility for demonstrating the equivalence of a method other than that described in paragraph 1. shall rest with the person using such a method.

1/ Note: The relationship of the reduced mass "m_r" of the pendulum to the total mass "m" of the pendulum at a distance "a" between the centre of percussion and the axis of rotation and at a distance "l" between the centre of gravity and the axis of rotation is given by the formula: $m_r = m \frac{l}{a}$

Annex 5

PROCEDURE FOR DETERMINING THE "H" POINT AND THE ACTUAL TORSO ANGLE FOR SEATING POSITIONS IN MOTOR VEHICLES

1. PURPOSE

The procedure described in this annex is used to establish the "H" point location and the actual torso angle for one or several seating positions in a motor vehicle and to verify the relationship of measured data to design specifications given by the vehicle manufacturer. 1/

2. DEFINITIONS

For the purposes of this annex:

2.1. "Reference data" means one or several of the following characteristics of a seating position:

2.1.1. the "H" point and the "R" point and their relationship,

2.1.2. the actual torso angle and the design torso angle and their relationship.

2.2. "Three-dimensional 'H' point machine" (3-D H machine) means the device used for the determination of "H" points and actual torso angles. This device is described in appendix 1 to this annex;

2.3. "'H' point" means the pivot centre of the torso and the thigh of the 3-D H machine installed in the vehicle seat in accordance with paragraph 4 below. The "H" point is located in the centre of the centreline of the device which is between the "H" point sight buttons on either side of the 3-D H machine. The "H" point corresponds theoretically to the "R" point (for tolerances see paragraph 3.2.2. below). Once determined in accordance with the procedure described in paragraph 4, the "H" point is considered fixed in relation to the seat-cushion structure and to move with it when the seat is adjusted;

2.4. "'R' point" or "seating reference point" means a design point defined by the vehicle manufacturer for each seating position and established with respect to the three-dimensional reference system;

2.5. "Torso-line" means the centreline of the probe of the 3-D H machine with the probe in the fully rearward position;

2.6. "Actual torso angle" means the angle measured between a vertical line through the "H" point the torso line using the back angle quadrant on the 3-D H machine. The actual torso angle corresponds theoretically to the design torso angle (for tolerances see paragraph 3.2.2. below):

2.7. "Design torso angle" means the angle measured between a vertical line through the "R" point and the torso line in a position which corresponds to the design position of the seat-back established by the vehicle manufacturer;

2.8. "Centreplane of occupant" (C/LO) means the median plane of the 3-D H machine positioned in each designated seating position; it is represented by the coordinate of the "H" point on the "Y" axis. For individual seats, the centreplane of the seat coincides with the centreplane of the occupant. For other seats, the centreplane of the occupant is specified by the manufacturer;

2.9. "Three-dimensional reference system" means a system as described in appendix 2 to this annex;

2.10. "Fiducial marks" are physical points (holes, surfaces, marks or indentations) on the vehicle body as defined by the manufacturer;

2.11. "Vehicle measuring attitude" means the position of the vehicle as defined by the coordinates of fiducial marks in the three-dimensional reference system.

3. REQUIREMENTS

3.1. Data presentation

For each seating position where reference data are required in order to demonstrate compliance with the provisions of the present Regulation, all or an appropriate selection of the following data shall be presented in the form indicated in appendix 3 to this annex:

3.1.1. the coordinates of the "R" point relative to the three-dimensional reference system;

3.1.2. the design torso angle;

3.1.3. all indications necessary to adjust the seat (if it is adjustable) to the measuring position set out in paragraph 4.3. below.

3.2. Relationship between measured data and design specifications

3.2.1 The coordinates of the "H" point and the value of the actual torso angle obtained by the procedure set out in paragraph 4 below shall be compared, respectively, with the coordinates of the "R" point and the value of the design torso angle indicated by the vehicle manufacturer.

3.2.2. The relative positions of the "R" point and the "H" point and the relationship between the design torso angle and the actual torso angle shall be considered satisfactory for the seating position in question if the "H" point, as defined by its coordinates, lies within a square of 50 mm side length with horizontal and vertical sides whose diagonals intersect at the "R" point, and if the actual torso angle is within 5° of the design torso angle.

3.2.3. If these conditions are met, the "R" point and the design torso angle, shall be used to demonstrate compliance with the provisions of this Regulation.

3.2.4. If the "H" point or the actual torso angle does not satisfy the requirements of paragraph 3.2.2. above, the "H" point and the actual torso angle shall be determined twice more (three times in all). If the results of two of these three operations satisfy the requirements, the conditions of paragraph 3.2.3. above shall apply.

3.2.5. If the results of at least two of the three operations described in paragraph 3.2.4. above do not satisfy the requirements of paragraph 3.2.2. above, or if the verification cannot take place because the vehicle manufacturer has failed to supply information regarding the position of the "R" point or regarding the design torso angle, the centroid of the three measured points or the average of the three measured angles shall be used and be regarded as applicable in all cases where the "R" point or the design torso angle is referred to in this Regulation.

4. PROCEDURE FOR "H" POINT AND ACTUAL TORSO ANGLE DETERMINATION

4.1. The vehicle shall be preconditioned at the manufacturer's discretion, at a temperature of 20 ± 10° C to ensure that the seat material reached room temperature. If the seat to be checked has never been sat upon, a 70 to 80 kg person or device shall sit on the seat twice for one minute to flex the cushion and back. At the manufacturer's request, all seat assemblies shall remain unloaded for a minimum period of 30 min prior to installation of the 3-D H machine.

4.2. The vehicle shall be at the measuring attitude defined in paragraph 2.11. above.

4.3. The seat, if it is adjustable, shall be adjusted first to the rearmost normal driving or riding position, as indicated by the vehicle manufacturer, taking into consideration only the longitudinal adjustment of the seat, excluding seat travel used for purposes other than normal driving or riding positions. Where other modes of seat adjustment exist (vertical, angular, seat-back, etc.) these will then be adjusted to the position specified by the vehicle manufacturer. For suspension seats, the vertical position shall be rigidly fixed corresponding to a normal driving position as specified by the manufacturer.

4.4. The area of the seating position contacted by the 3-D H machine shall be covered by a muslin cotton, of sufficient size and appropriate texture, described as a plain cotton fabric having 18.9 threads per cm^2 and weighing 0.228 kg/m^2 or knitted or non-woven fabric having equivalent characteristics. If test is run on a seat outside the vehicle, the floor on which the seat is placed shall have the same essential characteristics 2/ as the floor of the vehicle in which the seat is intended to be used.

4.5. Place the seat and back assembly of the 3-D H machine so that the centreplane of the occupant (C/LO) coincides with the centreplane of the 3-D H machine. At the manufacturer's request, the 3-D H machine may be moved inboard with respect to the C/LO if the 3-D H machine is located so far outboard that the seat edge will not permit levelling of the 3-D H machine.

4.6. Attach the foot and lower leg assemblies to the seat pan assembly, either individually or by using the T-bar and lower leg assembly. A line through the "H" point sight buttons shall be parallel to the ground and perpendicular to the longitudinal centreplane of the seat.

4.7. Adjust the feet and leg positions of the 3-D H machine as follows:

4.7.1. Designated seating position: driver and outside front passenger

4.7.1.1. Both feet and leg assemblies shall be moved forward in such a way that the feet take up natural positions on the floor, between the operating pedals if necessary. Where possible the left foot shall be located approximately the same distance to the left of the centreplane of the 3-D H machine as the right foot is to the right. The spirit level verifying the transverse orientation of the 3-D H machine is brought to the horizontal by readjustment of the seat pan if necessary, or by adjusting the leg and foot assemblies towards the rear. The line passing through the "H" point sight buttons shall be maintained perpendicular to the longitudinal centreplane of the seat.

4.7.1.2. If the left leg cannot be kept parallel to the right leg and the left foot cannot be supported by the structure, move the left foot until it is supported. The alignment of the sight buttons shall be maintained.

4.7.2. Designated seating position: outboard rear

For rear seats or auxiliary seats, the legs are located as specified by the manufacturer. If the feet then rest on parts of the floor which are at different levels, the foot which first comes into contact with the front seat shall serve as a reference and the other foot shall be so arranged that the spirit level giving the transverse orientation of the seat of the device indicates the horizontal.

4.7.3. Other designated seating positions:

The general procedure indicated in paragraph 4.7.1. above shall be followed except that the feet shall be placed as specified by the vehicle manufacturer.

4.8. Apply lower leg and thigh weights and level the 3-D H machine.

4.9. Tilt the back pan forward against the forward stop and draw the 3-D H machine away from the seat-back using the T-bar. Reposition the 3-D H machine on the seat by one of the following methods:

4.9.1. If the 3-D H machine tends to slide rearward, use the following procedure. Allow the 3-D H machine to slide rearward until a forward horizontal restraining load on the T-bar is no longer required i.e. until the seat pan contacts the seat-back. If necessary, reposition the lower leg.

4.9.2. If the 3-D H machine does not tend to slide rearward, use the following procedure. Slide the 3-D H machine rearwards by applying a horizontal rearward load to the T-bar until the seat pan contacts the seat-back (see figure 2 of appendix 1 to this annex).

4.10. Apply a 100 ± 10 N load to the back and pan assembly of the 3-D H machine at the intersection of the hip angle quadrant and the T-bar housing. The direction of load application shall be maintained along a line passing by the above intersection to a point just above the thigh bar housing (see figure 2 of appendix 1 to this annex). Then carefully return the back pan to the seat-back. Care must be exercised throughout the remainder of the procedure to prevent 3-D H machine from sliding forward.

4.11. Install the right and left buttock weights and then, alternately, the eight torso weights. Maintain the 3-D H machine level.

4.12. Tilt the back pan forward to release the tension on the seat-back. Rock the 3-D H machine from side to side through 10° arc (5° to each side of the vertical centreplane) for three complete cycles to release any accumulated friction between the 3-D H machine and the seat.

During the rocking action, the T-bar of the 3-D H machine may tend to diverge from the specified horizontal and vertical alignment. The T-bar must therefore be restrained by applying an appropriate lateral load during the rocking motions. Care shall be exercised in holding the T-bar and rocking the 3-D H machine to ensure that no inadvertent exterior loads are applied in a vertical or fore and aft direction.

The feet of the 3-D H machine are not to be restrained or held during this step. If the feet change position, they should be allowed to remain in that attitude for the moment.

Carefully return the back pan to the seat-back and check the two spirit levels for zero position. If any movement of the feet has occurred during the rocking operation of the 3-D H machine, they must be repositioned as follows:

Alternately, lift each foot off the floor the minimum necessary amount until no additional foot movement is obtained. During this lifting, the feet are to be free to rotate; and no forward or lateral loads are to be applied. When each foot is placed back in the down position, the heel is to be in contact with the structure designed for this.

Check the lateral spirit level for zero position; if necessary, apply a lateral load to the top of the back pan sufficient to level the 3-D H machine's seat pan on the seat.

4.13. Holding the T-bar to prevent the 3-D H machine from sliding forward on the seat cushion, proceed as follows:

(a) return the back pan to the seat-back;

(b) alternately apply and release a horizontal rearward load, not to exceed 25 N, to the back angle bar at a height approximately at the centre of the torso weights until the hip angle quadrant indicates that a stable position has been reached after load release. Care shall be exercised to ensure that no exterior downward or lateral loads are applied to the 3-D H machine. If another level adjustment of the 3-D H machine is necessary, rotate the back pan forward, re-level, and repeat the procedure from paragraph 4.12.

4.14 Take all measurements:

4.14.1 The coordinates of the "H" point are measured with respect to the three-dimensional reference system.

4.14.2. The actual torso angle is read at the back angle quadrant of the 3-D H machine with the probe in its fully rearward position.

4.15. If a re-run of the installation of the 3-D H machine is desired, the seat assembly should remain unloaded for a minimum period of 30 min prior to the re-run. The 3-D H machine should not be left loaded on the seat assembly longer than the time required to perform the test.

4.16. If the seats in the same row can be regarded as similar (bench seat, identical seats, etc.) only one "H" point and one "actual torso angle" shall be determined for each row of seats, the 3-D H machine described in appendix 1 to this annex being seated in a place regarded as representative for the row. This place shall be:

4.16.1. in the case of the front row, the driver's seat;

4.16.2. in the case of the rear row or rows, an outer seat.

1/ In any seating position other than front seats where the "H" point cannot be determined using the "Three-dimensional 'H' point machine" or procedures, the "R" point indicated by the manufacturer may be taken as a reference at the discretion of the competent authority.

2/ Tilt angle, height difference with a seat mounting, surface texture, etc.

Annex 5 - Appendix 1

DESCRIPTION OF THE THREE-DIMENSIONAL "H" POINT MACHINE*

(3-D H machine)

1. Back and seat pans

The back and seat pans are constructed of reinforced plastic and metal; they simulate the human torso and thigh and are mechanically hinged at the "H" point. A quadrant is fastened to the probe hinged at the "H" point to measure the actual torso angle. An adjustable thigh bar, attached to the seat pan, establishes the thigh centreline and serves as a baseline for the hip angle quadrant.

2. Body and leg elements

Lower leg segments are connected to the seat pan assembly at the T-bar joining the knees, which is a lateral extension of the adjustable thigh bar. Quadrants are incorporated in the lower leg segments to measure knee angles. Shoe and foot assemblies are calibrated to measure the foot angle. Two spirit levels orient the device in space. Body element weights are placed at the corresponding centres of gravity to provide seat penetration equivalent to a 76 kg male. All joints of the 3-D H machine should be checked for free movement without encountering noticeable friction.

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* For details of the construction of the 3-D H machine refer to Society of Automobile Engineers (SAE), 400 Commonwealth Drive, Warrendale, Pennsylvania 15096, United States of America.

The machine corresponds to that described in ISO Standard 6549-1980.

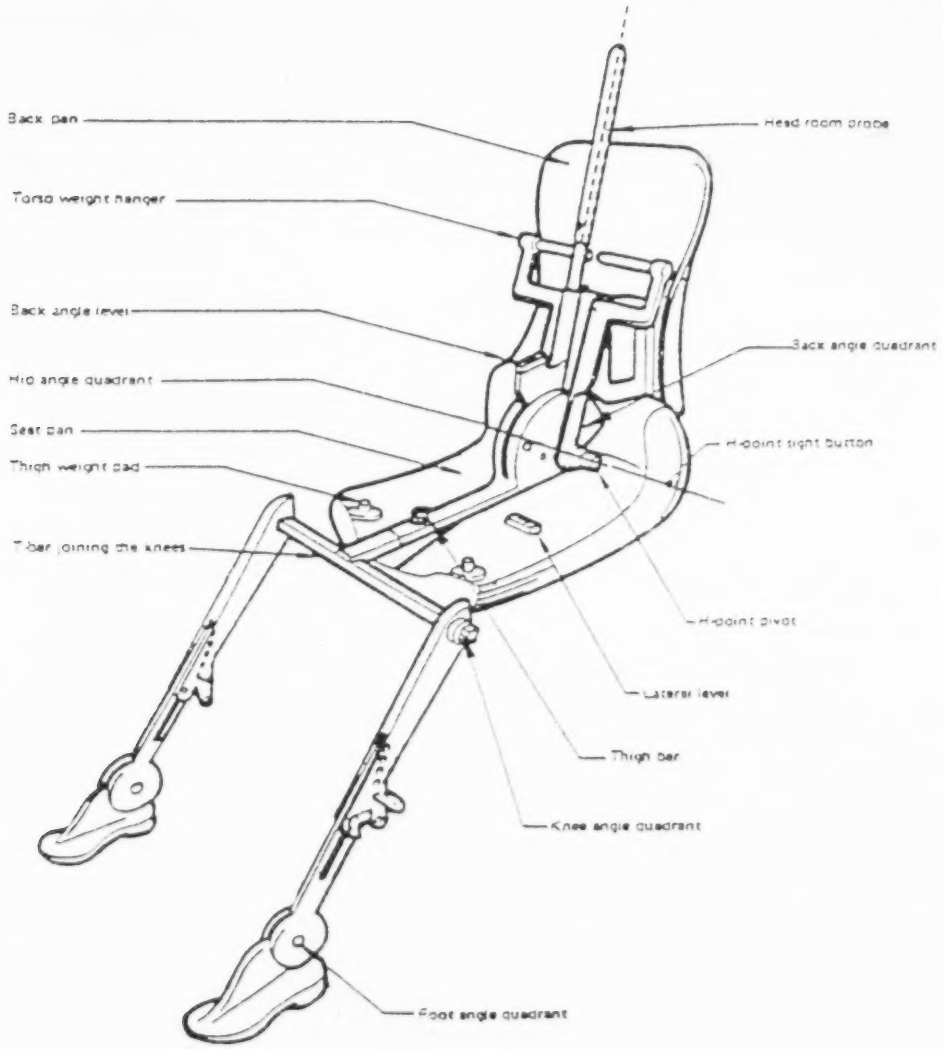

Figure 1 - 3-D H machine elements designation

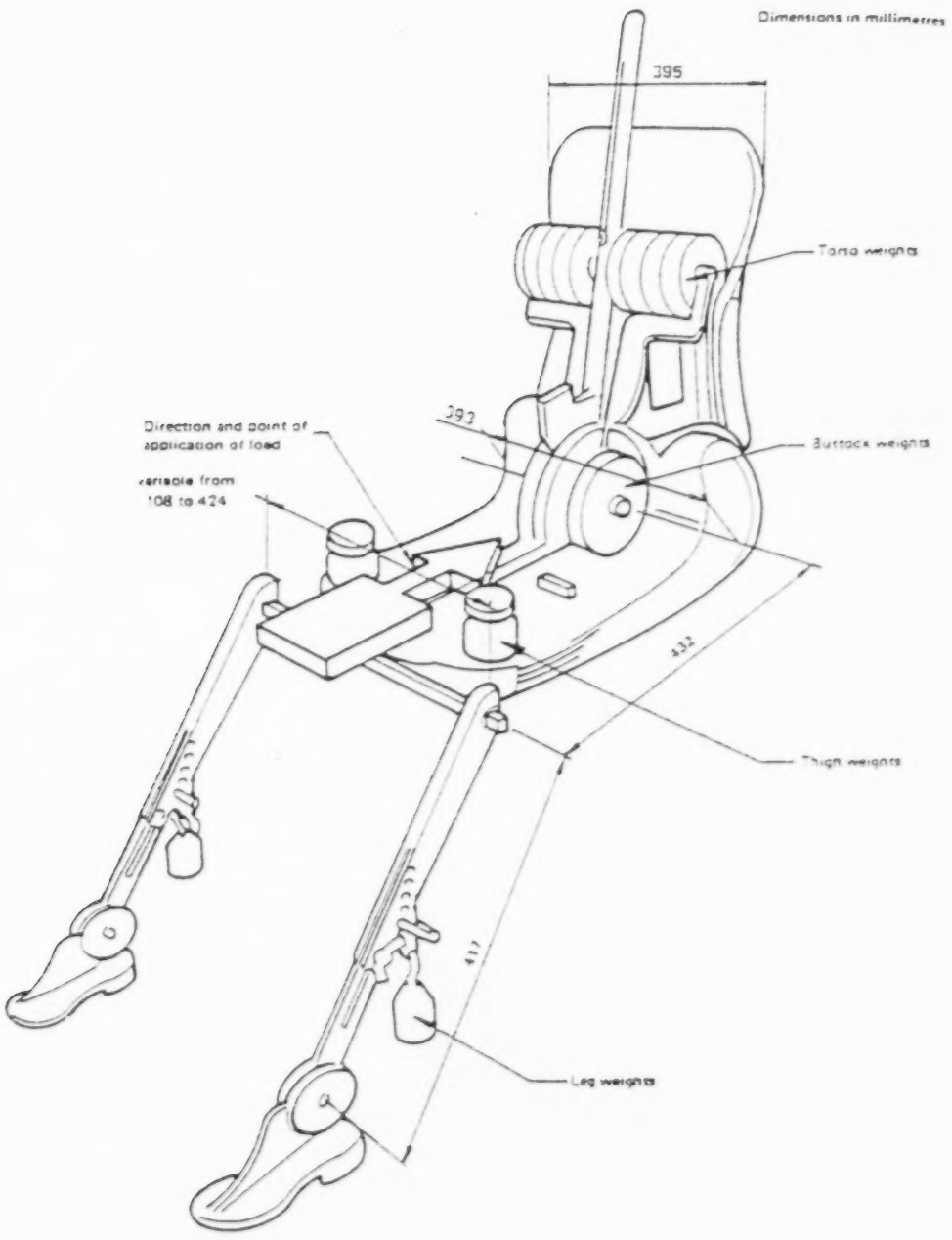

Figure 2 - Dimensions of the 3-D H machine elements and load distribution

Annex 5 - Appendix 2

THREE-DIMENSIONAL REFERENCE SYSTEM

1. The three-dimensional reference system is defined by three orthogonal planes established by the vehicle manufacturer (see figure).*

2. The vehicle measuring attitude is established by positioning the vehicle on the supporting surface such that the coordinates of the fiducial marks correspond to the values indicated by the manufacturer.

3. The coordinates of the "R" point and the "H" point are established in relation to the fiducial marks defined by the vehicle manufacturer.

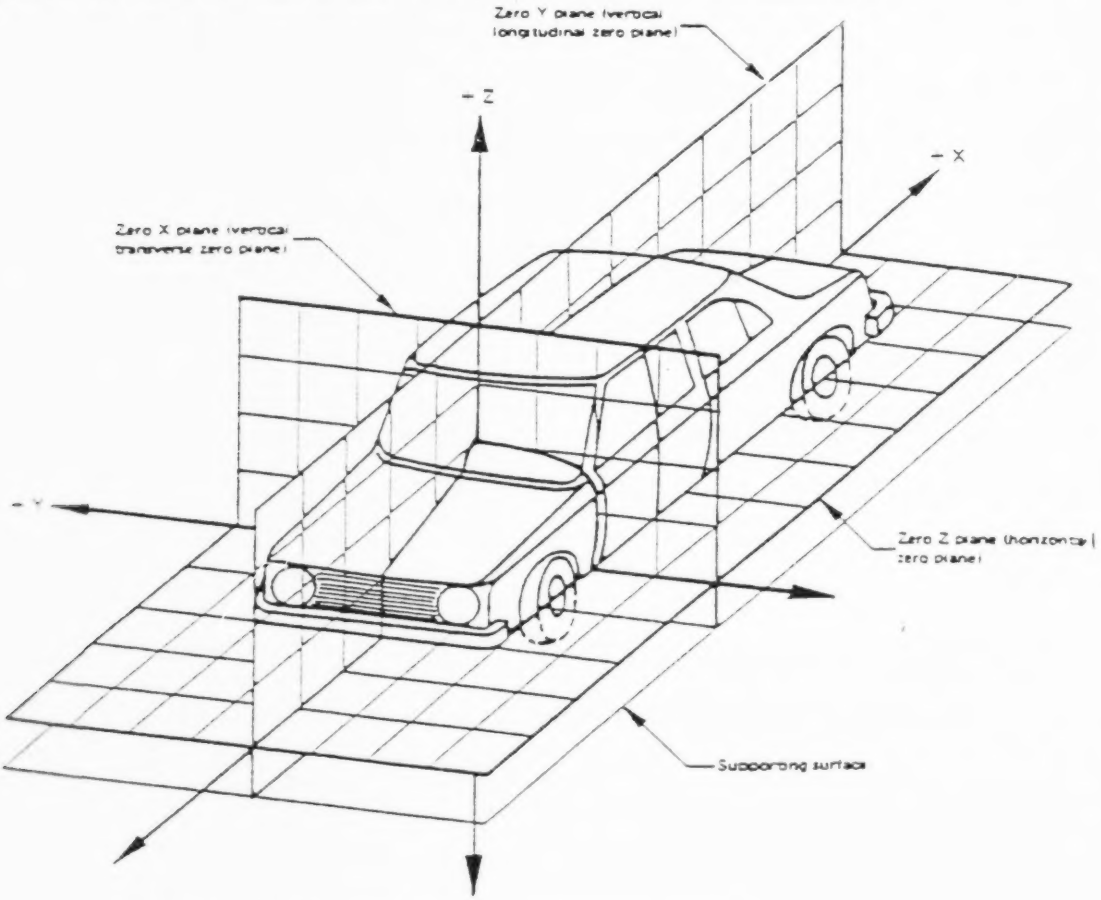
Zero Y plane (vertical longitudinal zero plane)
- Z
- X
Zero X plane (vertical transverse zero plane)
- Y
Zero Z plane (horizontal zero plane)
Supporting surface

Figure - Three-dimensional reference system

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* The reference system corresponds to ISO Standard 4130, 1978.

Annex 5 - Appendix 3

REFERENCE DATA CONCERNING SEATING POSITIONS

1. Coding of reference data

Reference data are listed consecutively for each seating position. Seating positions are identified by a two-digit code. The first digit is an Arabic numeral and designates the row of seats, counting from the front to the rear of the vehicle. The second digit is a capital letter which designates the location of the seating position in a row, as viewed in the direction of forward motion of the vehicle; the following letters shall be used:

L = left
C = centre
R = right

2. Description of vehicle measuring attitude

2.1. Coordinates of fiducial marks

X .....
Y .....
Z .....

3. List of reference data

3.1. Seating position: .....

3.1.1. Coordinates of "R" point

X .....
Y .....
Z .....

3.1.2. Design torso angle: .....

3.1.3. Specifications for seat adjustment*

horizontal: .....
vertical: .....
angular: .....
torso angle: .....

Note: List reference data for further seating positions under 3.2., 3.3., etc.

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* Strike out what does not apply.

Annex 6

METHOD OF MEASURING PROJECTIONS

1. To determine the amount by which an item projects in relation to the panel on which it is mounted, a 165 mm diameter sphere shall be moved along and be kept in contact with the component under consideration, starting from the initial position of contact with the component under consideration. The projection's value is the largest of all possible variations "y", the variation measured from the centre of the sphere perpendicular to the panel.

1.1. If the panels and components, etc., are covered with materials softer than 50 shore A hardness, the procedure for measuring the projections described above shall apply only after removal of such materials.

2. The projection of switches, pull-knobs, etc., situated in the reference area shall be measured by using the test apparatus and procedures described below:

2.1 Apparatus

2.1.1. The apparatus for measuring projections shall consist of a hemispherical headform 165 mm in diameter in which there is a sliding ram of 50 mm diameter.

2.1.2. Relative positions of the flat end of the ram and the edge of the headform shall be shown as a graduated scale on which a mobile index shall register the maximum measurement achieved when the apparatus is moved away from the item tested. A minimum distance of 30 mm shall be measurable; the measuring scale shall be graduated in half-millimetres to make possible an indication of the extent of the projections in question.

2.1.3. Gauging procedure

2.1.3.1. The apparatus shall be placed on a flat surface so that its axis is perpendicular to that surface. When the flat end of the ram contacts the surface, the scale shall be set at zero.

2.1.3.2. A 10 mm strut shall be inserted between the flat end of the ram and the retaining surface; a check shall be made to ensure that the mobile index records this measurement.

2.1.4. The apparatus for measuring projections is illustrated in the figure of the appendix to this annex.

2.2. Test procedure

2.2.1. A cavity shall be formed in the headform by pulling back the ram and the mobile index shall be placed against the ram.

2.2.2. The apparatus shall be applied to the projection to be measured so that the headform contacts the maximum surrounding surface area with a force not exceeding 2 daN.

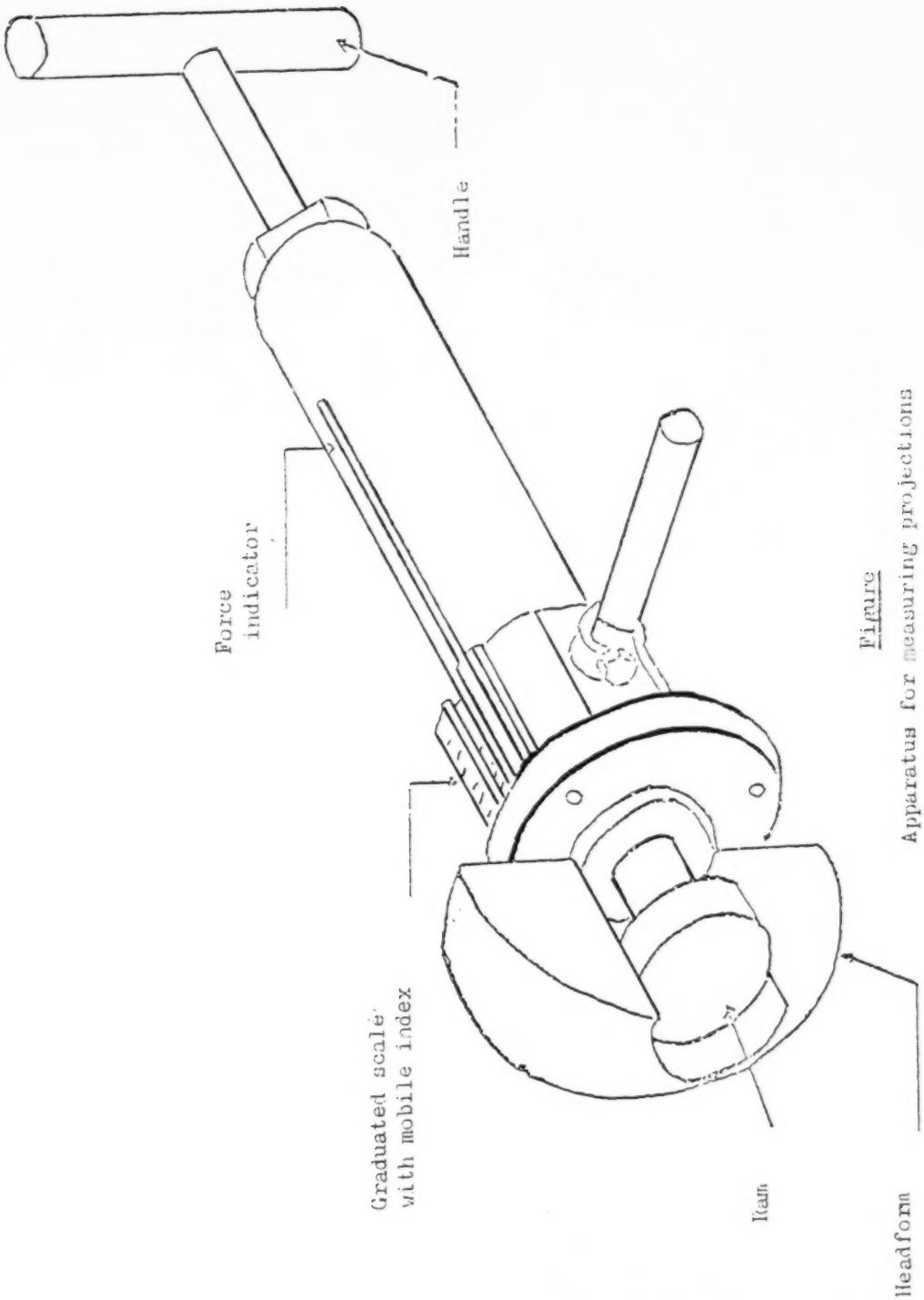
2.2.3. The ram shall be pushed forward until it makes contact with the projection to be measured and the amount of the projection shall be observed on the scale.

2.2.4. The headform shall be adjusted to obtain maximum projection. The amount of the projection shall be recorded.

2.2.5. If two or more controls are situated sufficiently close for the ram or the headform to contact them simultaneously, they shall be treated as follows:

2.2.5.1. Multiple controls, all of which can be contained in the headform cavity, shall be regarded as forming a single projection.

2.2.5.2. If other controls prevent normal testing by contacting the headform, they shall be removed and the test shall be conducted without them. They may subsequently be re-installed and tested in their turn with other controls that have been removed to facilitate the procedure.



Figure

Apparatus for measuring projections

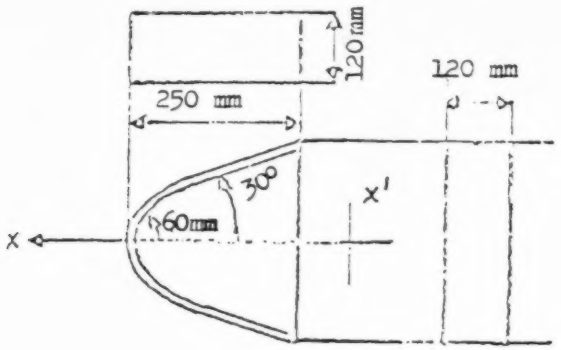
Annex 7

APPARATUS AND PROCEDURE FOR APPLICATION OF PARAGRAPH 5.2.1. OF THIS REGULATION

Those parts (switches, pull-knobs, etc.) which can be contacted by using the apparatus and procedure described below shall be considered as being likely to be contacted by the knees of an occupant. Foot-operated controls are fitted as foot pedals.

1. Apparatus

1.1. Diagram of apparatus



2. Procedure

The apparatus may be placed in any position below the level of the instrument panel so that:

2.1. the plane XX' remains parallel to the median longitudinal plane of the vehicle;

2.2. the axis X can be rotated above and below the horizontal through angles up to 30°.

3. In carrying out the above test, all materials of less than 50 shore A hardness shall be removed.